US Army Corps of Engineers®
Engineer Research and Development Center

Digital Topographic Support System – Terrain Analysis

Description and Background

Battlefield commanders rely heavily on **Intelligence Preparation of the Battlefield (IPB)** to reduce uncertainties concerning the enemy, weather, and terrain for all types of operations (FM 34-130, 1994). This process is initiated any time the commander faces a new enemy or receives a new mission. IPB analyses are most commonly used by the commander's operations and intelligence staff to support both defensive and offensive operations.

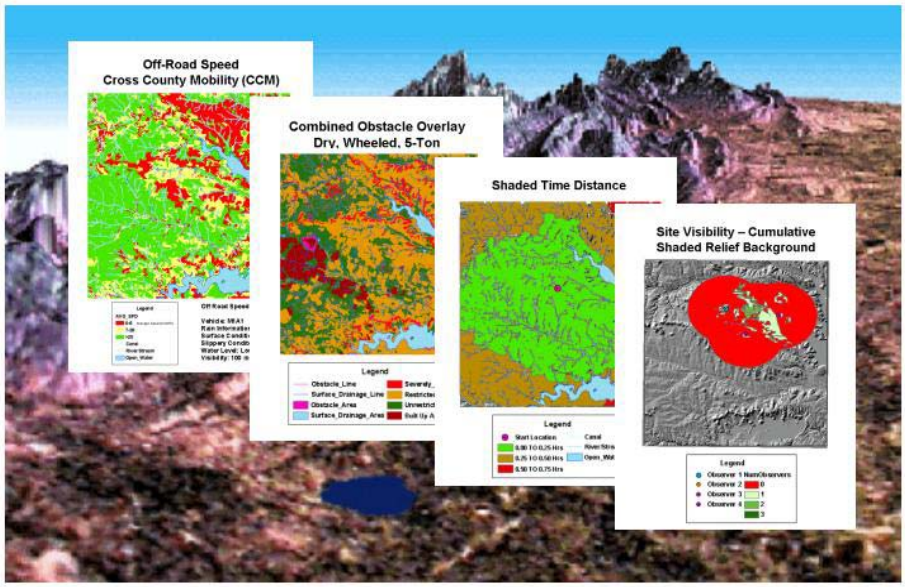
An integral part of the IPB process is terrain analysis. Terrain analysis consists of interpreting natural and man-made features of a geographic area, together with the influences of weather and climate, to determine their effects on military operations. This analysis must support IPB requirements at both the strategic and tactical levels of operation. Data at the 1:250,000 and smaller scales are used primarily to support strategic operations. This is considered to be high-level planning where commanders can obtain a broad overview of the battlefield. Tactical analysis is done at the 1:50,000 and larger scales. It provides the commander with a much more detailed view of specific areas-of-interest on the battlefield.

Army terrain teams, staffed by topographic analysts, are required to create terrain analysis products to support both strategic and tactical combat operations. Before they can analyze the military aspect of terrain, topographic analysts must know the mission of the unit, type of operation, level of command, composition of the forces involved, and weapons and equipment involved (FM 5-33, 1990). Based on these needs, the analyst creates various tactical decision aids (TDAs) by integrating terrain data together with weather and other dynamic battlefield information. Examples of battlefield TDAs include: 1) observation and fields of fire, 2) cover and concealment, 3) obstacles, 4) key terrain, and 5) avenues of approach. These TDAs are collectively referred to as **OCOKA** products.

Topographic analysts receive training in TDA generation, as well as interpretation of topographic maps, aerial photographs, and remotely sensed imagery. In an effort to improve the warfighters' decision-making process, the **Digital Topographic Support System (DTSS)** was created to facilitate terrain analysis and TDA generation. By integrating **geographic information systems (GIS)**, image processing, and data base management software together with scanning and communication technologies, the topographic analyst can "pull" existing data from appropriate sources, perform terrain analyses to create TDAs, enhance and/or create data as required, and "push" products and/or data across the battlefield to other DoD systems.

Although the DTSS is designed to exploit 1:50,000 scale vector feature data (point, line, polygon), the system can generate TDAs from *any* digital terrain data including national and commercial sources. The DTSS provides the user with an easy-to-use interface to the Army standard mobility model, as well as tools to create custom TDAs based on the area-of-operation, mission requirements, and available data. Image maps, 3D perspective views, and fly/drive-throughs can also be created using the **commercial-off-the-shelf (COTS)** software provided by the DTSS. TDAs generated on the DTSS can be output as map overlays for use on other systems that use the **Command and Control Personal Computer (C2PC)**, **Army Battle Command Systems (ABCS)**, and **Commercial Joint Mapping Toolkit (C/JMTK)** viewers.

The DTSS provides software to generate a variety of mobility, visibility, and special purpose TDAs. Mobility TDAs include off-road and on-road speed products, combined obstacle overlays (COOs), shaded time distance, and maneuver networks and predictions using **Battlespace Terrain Reasoning and Awareness (BTRA)**-provided applications. Visibility functions can be used to generate masked/visible areas for site (point), route (line), and region (area) analyses. The DTSS can also create special purpose products based on the area of operation, mission requirements, and available data. These include such things as helicopter landing zones (HLZs), bivouac sites, and lines of communication. Tools are also provided to perform more complex analyses that combine and/or buffer multiple products, as well as determine the proximity of features with regard to other features. Future DTSS functions will integrate hydrology and urban data into sophisticated TDAs to support the increasing demands on the warfighters' decision-making process.



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